Miscellaneous Publication 368

TEXAS AGRICULTURAL EXPERIMENT STATION

R. D. LEWIS, DIRECTOR, COLLEGE STATION, TEXAS, AUGUST 1959

Quality of the Rio Grande Tomato as Measured by Market Acceptance

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SUMMARY

An experiment conducted during May and June 1958, to evaluate the quality of the new Rio Grande tomato as determined by handling during the marketing system, shelf life and acceptance by consumers, showed the following results:

The grower obtained increased yields and larger fruit from the Rio Grande tomato than he did from the regular commercial varieties.

The packing shed operator handled a larger proportion of marketable tomatoes, and the percentage of culls decreased in comparison with commercial varieties.

The repack operator showed less spoilage loss and shorter ripening time with the Rio Grande tomato than with the commercial varieties.

Spoilage during shelf display was 2.1 percent, which is less than the accepted spoilage for commercial varieties.

Rio Grande tomato sales doubled or were 100 percent higher than the average warehouse bulk tomato sales, thus indicating consumer acceptance.

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A tomato breeding program was initiated at the Texas Agricultural Experiment Station at Weslaco in 1950 to develop varieties which would produce larger yields, possess better fruit quality and better disease resistance than varieties commonly grown.

Disease resistance and yielding ability can be measured rather accurately in field trials. Fruit quality, however, cannot be measured as accurately. Quality usually is defined in different ways by the various groups of people who handle tomatoes through their normal market channels.

The grower, the shipper, the grocer and the consumer may have different sets of standards by which they evaluate quality. The grower is concerned with the performance of the variety on his farm and judges quality by the appearance of the tomatoes in the field. The shipper or repacker is more concerned with the ease with which the fruit can be graded, packed and shipped and with the losses during these operations. The grocer is concerned with the appearance of the ripe fruit, the loss of fruit on his display shelves as caused by customer handling and fruit rots and with the rate at which the tomatoes sell. The consumer may determine quality by appearance and taste.

Tomatoes constantly change in firmness, color and flavor from harvest until they are consumed. The difficulties in evaluating the many factors associated with the changes complicate the plant breeders' efforts to determine quality and to satisfy the needs of the people through whose hands tomatoes pass in normal market channels.

The Rio Grande tomato was released for public use by the Texas Station in 1958. Previous tests had indicated that Rio Grande is more productive than the varieties now grown in the Weslaco area. The plant of Rio Grande is semideterminant in growth habit and is resistant to fusarium wilt and to grey leaf spot. The plants make a dense compact type of growth with ample foliage to protect the fruit. The fruit have green shoulders and are large, deep globe in shape. Rio Grande tomatoes are considerably larger than Rutgers. The fruits are firm, have a tough skin and ripen evenly.

The objective of this experiment was to evaluate the quality of the new Rio Grande tomato variety as determined by field performance, performance during ripening, grading, packing, shipping, shelf life and its acceptance as indicated by repeated purchases.

EXPERIMENTAL PROCEDURE

A 69-acre experimental field of Rio Grande tomatoes was grown in the Lower Rio Grande Valley during the spring tomato season of 1958. When the tomatoes were harvested they were graded, sized, packed in 60-pound wirebound Bruce boxes and placed in commercial ripening rooms. As the tomatoes ripened, they were re-

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moved from the ripening rooms, graded and sized again, packed and shipped by refrigerated trucks to retail stores in Dallas and Bryan, Texas. The surplus ripened tomatoes were marketed through normal channels in another trade area.

In the experimental stores, Rio Grande tomatoes were sold in bulk while tomatoes from the regular source of supply were sold in tubes. The lack of small-sized fruit which are normally marketed in tubes made it necessary to market Rio Grande in bulk display only. For each experimental store selling Rio Grande tomatoes, a control store similar in size and in customer income group was selected for comparative purposes. These control stores sold only regular tomatoes both in bulk and in tubes. The same price ratio for bulk versus tube was maintained in all stores.

Records were kept on packing shed, ripening and repack operations, display spoilage, shelf life, customer count, produce item count and total sales. The experiment was conducted for approximately 6 weeks during May and June of 1958.

DISCUSSION OF DATA

Although the field experiment was not designed to determine the yielding ability of Rio Grande, the grower compared Rio Grande with Homestead, a commercial variety. The grower stated that Rio Grande tomatoes produced both larger yields and larger fruits.

Packing Shed

Approximately 241 thousand pounds of Rio Grande tomatoes were graded and sized at a commercial packing shed. The tomatoes were picked over a period of about 3 weeks, constituting 18 different lots. The distribution of tomatoes as they arrived from the field by grades and sizes by weight are shown in Table 1. Field pinks accounted for 6.7 percent of the total arrivals sold in normal trade channels. About 90 percent of the Rio Grande tomatoes that arrived at the packing plant were marketable fruit; the remainder was culls. This indicates that the grower did a good job of field grading the tomatoes. Of the total amount of fruit, 77 percent was 6 x 6 or larger in size. This is larger than most commercial varieties. Only 5.7 and 0.4 percent of the fruit were size 6 x 7 and 7 x 7, respectively.

TABLE 1. DISTRIBUTION OF SIZE AND GRADE BY WEIGHT OF RIO GRANDE TOMATO AT THE PACKING SHED, 1958

Item	Amount, pounds	Percent
No. 1 5 x 6 and larger	77,329	32.1
No. 2 6 x 6	109,147	45.3
Grades 6 x 7	13,688	5.7
7 x 7	1,020	0.4
Pinks	16,186	6.7
Culls	23,481	9.8
Junk	70	[1]
Total	240,921	100.00

[1]Less than one half of .1 percent.

TABLE 2. DISTRIBUTION OF SIZE OF RIO GRANDE TOMATO AFTER RIPENING

Size	Weight, pounds	Percent
4 x 5	2,140	1.7
5 x 5	44,180	35.6
5 x 6	72,960	58.7
5 x 7	220	.2
6 x 7	4,720	3.8
Total	124,220	100.0

Repack Operation

After the ripening operation the Rio Grande tomato graded out 85.5 percent of number 1 grade and 14.5 percent number 2 grade.

Table 2 gives the distribution of fruit by sizes after ripening and also shows that 96.0 percent of the ripened tomatoes were 5 x 6 or larger. In the packing shed the tomatoes are laid on their sides, taking up less room in the lug. In the repack operation the tomatoes are laid on their shoulders. (When a tomato in the packing shed is shown to be 6 x 6 in size, it means that 6 tomatoes are laid across the lug and 6 are laid down the side of the lug.) In the repack operation when a tomato is 6 x 6 in size, five tomatoes are laid face down across the top and six are laid face down across the side of the lug. Thus the tomato is sold as 5 x 6 and has increased one size, 37 percent of the tomatoes were 5 x 5 or larger in size, 59 percent were 5 x 6 in size and 4 percent were in the 5 x 7 and 6 x 7 size.

Between 6 and 7 percent of the tomatoes spoiled during the ripening period, which is considerably less than the accepted average of about 13 percent. Another 2 to 3 percent of the fruits were discarded because of box damage or because they were culls that were not removed in the first grading operation.

Previous studies made by the Texas Station—reported in Bulletin 820, "Method of Determining the Optimum Stage of Maturity for Picking Green-wrap Tomatoes"—show that 90 percent of a lot of tomatoes 6 x 6 or larger in size ripen in approximately 12 days. Seventy percent of a lot of tomatoes 6 x 7 or smaller in size ripen in 16 days. The average ripening time required for the Rio Grande tomatoes varied from 8 to 12 days.

TOMATO SALES

The Rio Grande showed a high total percent of sales. In the experimental stores, 52 percent of all tomatoes sold were in bulk form. In the control stores where the regular warehouse bulk tomatoes were on sale, only 27 percent of the total tomatoes sold were in bulk form. Bulk sales of Rio Grande were 100 percent higher than sales of regular warehouse tomatoes.

The sale of these experimental tomatoes covered six periods, including four periods of 4 complete weeks and two periods of 2 days each. The 2-day periods were used at the beginning and at the end of the the 4-week periods. During the first period the experimental bulk tomatoes made up 70 percent of the total sales; tube tomatoes were reduced drastically to 30 percent by the bulk sales of Rio Grande tomatoes. In the control stores the sale of bulk tomatoes was only 18 percent as compared with tube tomatoes, 82 percent, Table 3. However, during the study the experimental bulk tomato sales decreased from 70 percent to 32.5 percent of the total sales while the controlled bulk tomato sales increased from 18 percent to 38 percent. Some of the increased sales of regular warehouse tomatoes may be caused by differences in quality due to different varieties or areas of production.

The percentage of the total weight sold at each of the various prices is shown in Table 4. Tube tomatoes consistently sold at a price lower than bulk tomatoes. At the highest price, the Rio Grande bulk tomato sales represented about 60 percent of the total sales compared with about 41 percent for bulk sales in the control stores. At the lowest price these percentages were 41.3

TABLE 3. PERCENT TOTAL SALES OF BULK AND TUBE TOMATOES IN EXPERIMENTAL AND CONTROLLED STORES DURING VARIOUS WEEKS

Period	Bulk displays		Tube displays	
	Store		Store	
	Experimental Rio Grande	Controlled warehouse	Experimental warehouse	Controlled warehouse
	— — — — — — Percent — — — — — —			
1 - 2 days	70.2	18.1	29.8	81.9
2 - 7 days	63.7	44.1	36.3	55.9
3 - 7 days	50.1	33.7	49.9	66.3
4 - 7 days	35.5	28.7	64.5	71.3
5 - 7 days	37.6	33.9	62.4	66.1
6 - 2 days	32.5	38.1	67.5	61.9

TABLE 4. PERCENT TOTAL SALES OF BULK AND TUBE TOMATOES IN EXPERIMENTAL AND CONTROLLED STORES AT VARIOUS PRICES

Price		Bulk displays		Tube displays	
		Store		Store	
Bulk	Tube	Experimental Rio Grande	Controlled warehouse	Experimental warehouse	Controlled warehouse
— Cents —		— — — — — — Percent — — — — — —			
39	35[1]	59.7	40.8	40.3	59.2
35	29	78.7	54.0	21.3	46.0
29	25	87.4	33.0	12.6	67.0
25	21	46.0	35.3	54.0	64.7
23	19	22.9	18.6	77.1	81.4
21	19	41.3	15.1	58.7	84.9

[1]Price of tubes at the indicated bulk price.

and 15.1 percent, respectively. When the price spread between bulk and tube tomatoes was reduced to 2 cents, the percent of sales of Rio Grande almost doubled while the bulk sales in the control stores registered a continued decrease.

SPOILAGE

There was about 4 percent spoilage to the tomatoes while they were in containers during transit and before they were placed on the display shelf. Spoilage during shelf display was 2.1 percent. Bulk display spoilage was much lower than that occurring in previous experimental work. In previous tests, display spoilage of other varieties averaged about 5 percent.

ACKNOWLEDGMENTS

The authors express their appreciation to John M. Kitamura, Santa Maria, Texas, for producing the tomatoes; Interstate Fruit and Vegetable Company, La Feria, Texas, for the commercial grading, packing and ripening operation and shipping of the Rio Grande tomatoes; Safeway Stores, Inc., Dallas, Texas, and Orr's Supermarket, Bryan, Texas, for the retail store operation.